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SIEMENS CORPORATION
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EXAMINER

BLACKWELL, GWENDOLYN

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1794

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

DETAILED ACTION

Examiner's Comment

1. Applicant has amended claim 1 to include the transitional phrase “consisting essentially of” with regards to the composition of the metallic protective layer. “Consisting essentially of” limits the scope of the claim to the specified materials "and those that do not materially affect the basic and novel characteristic(s) of the claimed invention. However, Applicant has not provided a clear indication in the specification or claims as to what the basic and novel characteristics actually are. As such, claim 1 will be interpreted in terms of “comprising”. *MPEP 2111.03*.

Claim Rejections - 35 USC § 102/103

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 19-20, 22 and 34 are rejected under 35 U.S.C. 102(b) as being anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over United States Patent no. 4,711,665, Simkovich.

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Regarding claims 19-20

Simkovich discloses an oxidation resistant alloy that can be used as a coating, (column 1, lines 19-21), comprised of 8-12 wt% Cr, about 3-22 vol% Si₃N₄, about 1-2 wt% Si, and about 0.05-0.2 wt% of a reactive element and balance Fe, Ni, Co and alloys thereof, (column 1, lines 51-60). The reactive element is a metal such as Y, Sc, Th, La, or another rare earth element, (column 2, lines 24-45).

Regarding claims 22 and 34

The alloy used for the coating is used in turbine engines, (column 1, lines 9-13; column 3, lines 51-55). As the substrate material used in turbine engines is metallic, it would be expected that the coating of Simkovich when used in a turbine engine would be placed on a metallic substrate.

Claim Rejections - 35 USC § 102

5. Claims 34-36 are rejected under 35 U.S.C. 102(b) as being anticipated by United States Patent no. 2,290,007, Buckland.

Regarding claims 34-36

Buckland discloses a turbine blade made of an alloy that is treated to form a protective surface layer. The surface area is a fine grained alloy while the underlying substrate is a coarse grained alloy, both having the same base alloy material. Buckland teaches that iron based alloys which are usable include N155 which has 20 wt% Cr, 0.4 wt% Si (column 2, lines 35-55), and no aluminum or rare earth metals, with the balance iron. Other alloys are also discussed which include aluminum in very low amounts. As the protective layer is formed from the substrate material, it will have the same overall

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composition. The substrate as stated above is metallic (iron alloy) and the article is a turbine blade.

The formed layer is a distinct layer from that of the substrate which is adhered to the substrate. “[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985) (citations omitted). *MPEP 2113*.

Claim Rejections - 35 USC § 103

6. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent no. 4,711,665, Simkovich as applied to claim 19 above.

Regarding claim 21

Simkovich discloses the compositional limitations of the metallic protective layer above. Aluminum may be added to the alloy, although it is preferred to not add Al at all, (column 2, lines 26-29). Simkovich does not explicitly disclose the amount of aluminum present in the protective coating.

Absent a showing of criticality with respect to the amount of aluminum (a result effective variable), it would have been obvious to a person of ordinary skill in the art at the time of the invention to adjust the amount of aluminum through routine experimentation in order to achieve an alloy that has the desired stable surface oxide formed. It has been held that discovering an optimum value of a result effective variable

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involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

7. Claims 22-28 and 30-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent no. 5,939,204, Czech, in view of United States Patent no. 4,999,158, Corwin.

Regarding claim 22

Czech discloses a protective layer formed on a metallic substrate, (column 1, lines 43-48), wherein the protective coating is comprised of 10-40 wt% chromium, 0-20 wt% aluminum, 0-10 wt% silicon, and at least one reactive element such as yttrium, scandium, and other rare earth elements, with the balance being at least one element selected from iron, cobalt, and nickel, (column 1, lines 13-21). Czech does not disclose the specific compositional ranges as exemplified by Applicant.

As the ranges of the prior art overlap those of the presently claimed invention, it would have been obvious to one of ordinary skill in the art at the time of invention to have selected the overlapping portion of the ranges disclosed by the reference because overlapping ranges have been held to be a prima facie case of obviousness. *In re Malagari*, 182 USPQ 549.

Regarding claim 23

The substrate upon which the coating is placed can be a nickel based superalloy or a cobalt based superalloy, (column 1, lines 43-48).

Regarding claims 24-27

Czech does not specifically disclose the structure of the substrate or the protective coating nor does Czech disclose that the layer system is diffusion treated. As the coating meets the structure limitations it would be expected that the coating would have a ferritic

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structure as well as the coefficients of thermal expansion. In addition, aluminum and/or silicon are known elements to be used in this type of substrate and coating. As aluminum and/or silicon are known elements, it would have been obvious to one skilled in the art at the time of invention to modify the amount of aluminum and/or silicon to produce an alloy that has a ferritic microstructure, as demonstrated by Corwin which discloses that aluminum and silicon are known strong ferritic formers, (Corwin, column 9, lines 27-30).

Regarding claim 28

Corwin discloses an iron based alloy having about 10 to about 30 wt% chromium, (Corwin, column 6, lines 12-15).

Regarding claim 30

Over the protective layer, a gas permeable ceramic thermal barrier coating layer of zirconium oxide can be placed, (Czech, columns 5-6, lines 55-9).

Regarding claim 31

The turbine component can be a rotor blade, guide vane, heat shield, or another highly thermally stressed part of a gas turbine, (Czech, column 1, lines 22-32).

Regarding claim 32

Czech while disclosing a protective layer does not explicitly disclose the thickness of the layer. Absent a showing of criticality with respect to thickness (a result effective variable), it would have been obvious to a person of ordinary skill in the art at the time of the invention to adjust the thickness through routine experimentation in order to achieve a protective coating that meets the desired thickness and protectiveness without being wasteful. It has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

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Regarding claim 33

The coated substrate can be exposed to temperatures of at least 1000° C, (Czech, column 4, lines 8-10).

8. Claims 34-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent no. 3,902,823, Minato et al, in view of United States Patent no. 2,920,007, Buckland.

Regarding claims 34-38

Minato teaches turbine blades comprising an alloy steel with the composition of 11-13.5 wt% chromium, preferably 11.5-12.5wt% Cr, up to 1 wt% silicon, and up to 0.2 wt% aluminum, and the balance iron. Minato does not teach a protective layer formed on the metallic substrate.

Buckland teaches a turbine blade comprising an iron base alloy similar to that of Minato and further teaches the formation of a fine grained surface layer thereon by treatment of the substrate material. Buckland teaches that the formation of this fine grain layers in a turbine component neutralizes stress concentrations and reduces stresses from small mechanical imperfections resulting from foreign particles passing through the turbine during use (col. 4, lines 24-50). As Buckland teaches that formation of a protective layer of a fine-grain surface resulting from treatment of the underlying substrate reduces or neutralizes stress in the turbine blade, it would have been obvious to one of ordinary skill in the art at the time of the invention to treat the substrate of Minato in a similar manner to form a protective layer over the blade structure. This would result in the formation of a protective layer having the same composition as the underlying substrate which falls within the instantly claimed ranges.

Regarding the thickness of the layer, Buckland teaches the turbine blade having a protective coating formed thereon as discussed above and teaches that the coating may be from a few mils to 22 mils thick (col. 2, lines 15-20) which overlaps with the claimed range of 100 to 300 microns. It would have been obvious to one of ordinary skill in the art at the time of the invention to have selected the overlapping portion of the ranges disclosed by the reference because overlapping ranges have been held to be a prima facie case of obviousness, *In re Malagari*, 182 USPQ 549. Furthermore, it would have been obvious to adjust the thickness of the protective layer to provide the maximum protection to the underlying substrate thereby reducing cost of repair and replacement.

Response to Arguments

9. Applicant's arguments with respect to claims 1-28 and 30-33 have been considered but are moot in view of the new ground(s) of rejection based on Applicant's amendments.

10. Applicant's arguments filed March 2, 2009 have been fully considered but they are not persuasive with regards to claims 34-38 rejected under 35 U.S.C. § 103, Minato et al in view of Buckland.

Applicant contends that (1) Buckland et al does not teach or suggest a metallic protective layer having a 1.5 wt% silicon or a protective layer applied and bonded to the substrate by adhesion, (2) Minato et al teaches a fluid compressor wheel not a turbine blade, and (3) Minato et al teaches away from Applicant's invention

11. With regards to contention (1), claim 34 do not require that the silicon content is 1.5 wt%, the amount of silicon in claim 34 is 0.3-1.5 wt% silicon and in the range of 0.5-1.0 wt% in claim 38. In addition, the limitation that the metallic protective layer is

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applied and bonded to the substrate by adhesion is a process limitation that does not provide a patentable distinction over the prior art of record. There are two distinct layers in the invention Buckland wherein the surface coating is bonded and adhered to the substrate.

12. With regards to contention (2), Minato et al teaches an impeller, which is a vane or blade, that can be used in gas compressors and blowers (abstract) not just a compressor wheel.

13. With regards to contention (3), Minato teaches a range that substantially overlaps the range of claim 34, 0.3-1.5 wt%, and shares an endpoint with claim 38, 0.5-1.0 wt%, with regards to the amount of silicon. It is unclear how this substantial overlap teaches away from Applicant's claimed invention as set forth in claims 34-38.

14. For the reasons set forth above and of record, claims 19-28 and 30-38 remain rejected.

Conclusion

15. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

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extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to GWENDOLYN BLACKWELL whose telephone number is 571-272-5772. The examiner can normally be reached on Monday - Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jennifer McNeil can be reached on 571-272-1540. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/GWENDOLYN BLACKWELL/
Primary Examiner, Art Unit 1794